REMARKS

Favorable reconsideration of this application is respectfully requested in view of the following remarks.

Claim 10 has been amended to change the wording for purposes of ensuring that proper antecedent basis exists for the claim language. Also, new Claims 17-22 are presented for consideration.

The only issue raised in the Official Action involves the rejection of original Claims 1-16 on the basis of the disclosure contained in U.S. Patent No. 4,721,500 to *Van Handel et al.* in view of the disclosure contained in U.S. Patent No. 6,180,926 to *Duddy et al.* This rejection is respectfully traversed for several reasons.

The claimed invention at issue here pertains to a pressing apparatus for forming food service paperboard articles. As described in the background portion of the present application, known types of pressing apparatus for producing food service paperboard articles utilize electrically resistive ring heaters, with one or two such ring heaters being provided in each of the upper die and lower die of the pressing apparatus. The background portion of the present application describes a variety of disadvantages and drawbacks associated with this conventional use of ring heaters in a paperboard pressing apparatus. The recognition of these problems by the inventors here led to the development of the present invention.

The production of food service paperboard articles typically requires relatively high temperatures. As discussed in the application, this typically means that the ring heaters

must possess a very high wattage. In operation, the ring heaters are oftentimes run at a wattage on the order of 1500 watts - 5000 watts. This significantly exceeds the power wattage ratings of the ring heaters which is typically on the order of 300 watts - 1200 watts. Operating the ring heaters at levels greatly exceeding the power wattage ratings of the ring heaters significantly reduces the life of the ring heaters and requires that the heaters be replaced rather frequently.

The ring heater construction is also problematic in that it is susceptible to the ingress of water. This infiltrated water is transformed into steam pressure which can distort the sheath of the ring heater so that the sheath takes on a curved configuration such as shown in Fig. 2B of this application. This results in a rather substantial loss of contact area with the die, thus reducing heat transfer to the die and causing inadequate and non-uniform heating.

As discussed beginning in line fifteen on page seven of the application, this distortion of the ring heater can lead to other difficulties in that it places further strain on the operational rating of the ring heater. Respective thermocouple probes are typically provided on the upper and lower dies in which are mounted the ring heaters. These thermocouple probes measure the temperature near the surfaces of the upper and lower dies to determine the operating parameters of the ring heaters. When the thermocouple detects that the die surface temperature is excessively low, the ring heaters are turned on at full wattage for time proportioned periods regulated by a temperature controller. When the ring heater distorts in the manner mentioned above and illustrated in Fig. 2B, heat is not

effectively transferred to the die and so the thermocouple determines that the die heating surfaces are not sufficiently hot. This causes the ring heaters to be run at full wattage and higher temperatures for longer periods of time, and creates further operational problems that significantly reduce the operating life of the ring heaters.

The background portion of this application also points out that another source of problem with ring heaters involves the potential for wire breakage. The construction of the ring heaters and the environment in which they are used in paperboard pressing apparatus makes them susceptible to wire breakage. Also, as discussed beginning at line 10 of page three of the application, it has been found that cold spots sometimes exist in ring heaters. To address this, the terminals are positioned in a particular manner, although this causes the terminals to run relatively hot which may lead to wire insulation degradation and failure due to the wires shorting to ground.

In the event the ring heater or ring heater wire breaks down or fails, the entire press must be stopped so that the ring heater or wire can be replaced. All of the other die sets in the press must thus also be shut down, thus resulting in a significant reduction in productivity. Thus, in addition to the cost associated with purchasing new ring heaters to replace the unusable ring heaters, there is also the cost associated with downtime of the pressing apparatus while the ring heater is replaced.

The pressing apparatus of the present invention utilizes a cast-in heater(s) rather than ring heaters. However, as the present application points out, the cost associated with one cast-in heater is typically on the order of about eight times more expensive than the

cost of one ring heater. Thus, the cost differential would seem to suggest that replacing ring heaters with cast-in heaters is not economically practical. This is where the inventive contributions of the inventors come into play. By recognizing a variety of the shortcomings associated with the use of ring heaters in paperboard pressing apparatus and the way in which these shortcomings adversely affect the operational life of the ring heaters and the productivity of the overall press in which the ring heaters are employed, and discovering that cast-in heaters are not as susceptible to many of the same difficulties and in fact make it possible to achieve quite significant benefits in various areas, the inventors have established that the much greater purchase cost associated with cast-in heaters is offset by the gains realized in, for example, productivity and other areas.

The inventors have discovered, for example, that a single cast-in heater can be used in place of two nested ring heaters that are oftentimes used in one or both of the dies. Also, the construction of the cast-in heater is not nearly as susceptible to the ingress of water and so the distortion problems associated with ring heaters is not likely to occur. The cast-in heater thus maintains a flatter surface to provide more uniform heating as well as better heat transfer. Also, a cast-in heater does not have to be operated at the same high wattage as the ring heaters, and can in fact be operated at significantly lower wattage while still achieving the necessary temperature at the die surface. In contrast to ring heaters previously used, cast-in heaters can be purchased with a wattage rating within recommended guidelines, thus resulting in a significantly longer heater life. Additionally, cast-in heaters have substantially lower heater surface temperatures during heat up and

production than in the case of ring heaters. The maximum heater temperatures for cast-in heaters during standard die set heat up is quite a bit less than ring heaters as mentioned at the bottom of page 38 of the application. Further, cast-in heater temperatures during production of food serving paperboard plate products are significantly lower than ring heaters. The realization of electrical cost savings is also possible with cast-in heaters because of their lower wattage and more efficient thermal transfer to the die set.

The wire heater connection can be made exterior of the cast-in heater and so wire breakage due to degradation of the wire from excessive temperature is not as likely to occur. In addition, because cast-in heaters are not as susceptible to many of the problems associated with the use of ring heaters in paperboard pressing apparatus, the cast-in heaters have a significantly longer useful life. It is thus not necessary to replace the cast-in heaters with the same frequency as ring heaters, thus reducing the down-time of the pressing apparatus.

The discussion beginning on page 36 of the application discusses a break-even cost analysis that was performed using ring heaters in a food service paperboard container forming apparatus versus the use of cast-in heaters in a similar apparatus. The analysis acknowledges the significantly greater cost associated with cast-in heaters, but ultimately concludes, by virtue of the significantly reduced incidence of downtime resulting from the reduction or elimination of many of the problems associated with ring heaters, that the use of cast-in heaters meets or exceeds the break-even point.

Turning now to the rejection set forth in the Official Action, *Van Handel et al.* discloses a pressing apparatus for forming a paperboard container. *Van Handel et al.* mentions that the upper and lower dies can be heated with electrical resistance heaters. Thus, the pressing apparatus described in *Van Handel et al.* is similar to the known types of pressing apparatus described above and in the background portion of the present application.

Recognizing that *Van Handel et al.* does not disclose the use of cast-in heaters, the Official Action relies upon the disclosure contained in *Duddy et al.* and concludes that it would have been obvious to replace the electrical resistance heaters described in *Van Handel et al.* with cast-in heaters. This position is untenable for several reasons.

First, the relevant disclosure in *Duddy et al.* pertains to a heater device for a semiconductor wafer support. The disclosed device is used in the manufacture of semiconductor devices utilizing processes that require the semiconductor wafers to be maintained at a stable temperature. The discussion in column 1 of *Duddy et al.* points out that heater assemblies forming a portion of a semiconductor wafer support typically include a platen fabricated of thermally conducted material and having a top surface shaped to support a semiconductor wafer within a process chamber. A heating element is mounted in or under the platen in thermally conductive contact with the platen surface so that the semiconductor wafer supported by the platen can be heated during processing. *Duddy et al.* mentions that the heating element can be cast-into the material forming the platen.

One weakness in the asserted rejection is that *Van Handel et al.* does not recognize that difficulties exist with respect to the use of the disclosed electrical resistance heaters. Consequently, an individual considering the disclosure contained in *Van Handel et al.* would have found no reason to employ a different type of heater, let alone a cast-in heater as claimed.

In addition, even if one were somehow motivated to utilize an alternative to the electrical resistance heaters described in *Van Handel et al.*, one would not have found the disclosure contained in *Duddy et al.* to be particularly relevant with respect to providing guidance on alternative heaters. As mentioned above, the disclosure in *Duddy et al.* is specifically concerned with a platen that supports a semiconductor wafer. The platen is provided with a heating element for heating the semiconductor wafer during processing. The disclosure in *Duddy et al.* is not concerned with a paperboard pressing apparatus that utilizes upper and lower dies for forming a food service paperboard article or container. Hence, the disclosure contained in *Duddy et al.* would not have been found to be particularly relevant insofar as providing guidance for modifying the paperboard container pressing apparatus disclosed in *Van Handel et al.*

A further deficiency in the stated rejection is that *Duddy et al.* actually teaches away from using the disclosed heating element that is cast-into the semiconductor wafer supporting platen. The discussion beginning in line 33 of column 1 of *Duddy et al.* mentions that one manufacturing technique for producing a heater assembly used in connection with a semiconductor wafer support involves a cast-in method in which a

heating element is cast-into the platen during formation of the platen. *Duddy et al.* goes on to describe that this cast-in method involves inserting a resistive heating element into molten material during manufacture of the platen. As noted by *Duddy et al.*, this requires the use of a heating element having a melting point substantially higher than the melting point of the platen material. *Duddy et al.* thus observes that when stainless steel or aluminum material is used for the heating element, the types of material that can be used to fabricate the platen are quite limited. After recognizing this drawback associated with heating elements that are cast-into the platen, *Duddy et al.* discusses near the bottom of column 1 the need for an improved temperature control apparatus that is not limited with respect to the materials used for fabricating the platen and the heat exchange element. In short, *Duddy et al.* specifically seeks to avoid using a heating element that is cast-into the platen. Thus, the discussion in *Duddy et al.* regarding a heating element that is cast-into a platen actually directs one from using such a construction.

A still further reason why it would not have been obvious to replace the electrical resistive heater described in *Van Handel et al.* with a cast-in heater as claimed is that the cost of cast-in heaters is significantly greater than the cost of the conventionally used ring heaters. As mentioned above, the cost differential between the two can be on the order of approximately eight times. Absent expressly identified reasons, this significant cost differential would direct one away from replacing conventional ring heaters in paperboard pressing apparatus with a cast-in heater(s).

As discussed above, the inventors here recognized a number of rather significant difficulties associated with the conventional use of ring heaters in paperboard pressing apparatus. The recognition of these problems led to the rather surprising discovery that utilizing a significantly more expensive heater can actually provide economic or monetary benefits when considered in the context of commercial production. That is, the inventors discovered that many of the problems associated with the conventional use of ring heaters in paperboard pressing apparatus are reduced or eliminated with the use of cast-in heaters. Thus, for example, cast-in heaters have a significantly longer useful life which means that the cast-in heaters need not be replaced with nearly the same frequency as ring heaters. This advantageously reduces the down-time of the pressing apparatus which translates into an economic benefit. With this discovery, it was found that the significantly greater cost associated with cast-in heaters is offset by, for example, the decrease in heater replacement frequency and cost and the increase in productivity associated with less pressing apparatus downtime. Absent recognition of the problems and discovery of a solution which permits realization of benefits offsetting the quite substantial increased cost associated with the solution, one would not have been led to do that which is defined in the claims as the invention.

As noted above, there is no recognition in *Van Handel et al.* that any difficulties exist with respect to the disclosed electrical resistance heaters. Thus, there would be no reason why one would consider replacing the disclosed electrical resistance heaters with

another type of heater, let alone a cast-in heater that is significantly more expensive than the disclosed electrical resistance heaters. Indeed, logic dictates just the opposite.

In addition, *Duddy et al.* does not recognize that the disclosed heating element cast-into the platen can address shortcomings associated with the use of ring heaters, particularly ring heaters in paperboard pressing apparatus. The way in which the heating device described in *Duddy et al.* is employed is not likely to lead to the same difficulties as those that arise in the context of the conventional use of ring heaters in paperboard pressing apparatus and so it is not surprising that *Duddy et al.* is lacking with respect to a disclosure that the disclosed heating element cast-into the platen can address problems and difficulties associated with the use of ring heaters in paperboard pressing apparatus.

For at least the reasons identified above, it is submitted that one would not have been motivated to carry out the modification proposed in the Official Action on the basis of the disclosures contained in *Van Handel et al.* and *Duddy et al.*

Further, even if some motivation did exist for the proposed modification, the result would not be that which is claimed. For example, Claim 1 defines that the first and second cast-in heaters, which each include a resistor wire embedded within a thermally conductive cast-in material, are mounted within a recess in the respective dies. *Duddy et al.* does not disclose mounting a cast-in heater, having a resistor wire embedded within a thermally conductive cast-in material, in a recess. Rather, *Duddy et al.* describes that a heating element is cast-into the platen.

In addition as set forth in new independent Claim 19, as well as various ones of the new dependent claims, the cast-in heater is removably positioned in the die. Once again, this is not what is described in *Duddy et al.*

Also, new dependent Claim 22 defines the air tube extending through holes in the cast-in heater and die. *Duddy et al.* does not disclose an air tube that extends through holes in a cast-in heater and a die in which the cast-in heater is removably positioned.

For at least the reasons set forth above, it is submitted that the claimed invention at issue here is patentably distinguishable over a hypothetical combination of the disclosures contained in *Van Handel et al.* and *Duddy et al.* Accordingly, withdrawal of the rejection of record and allowance of this application are earnestly solicited.

Should any questions arise in connection with this application or should the Examiner believe that a telephone conference with the undersigned would be helpful in resolving any remaining issues pertaining to this application, the undersigned respectfully requests that he be contacted at the number indicated below.

Respectfully submitted,

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Attachment to Amendment dated October 17, 2001

Marked-up Claim 10

10. (Amended) The pressing apparatus according to Claim 9, wherein the [first] cast-in heater is mounted in the first die and constitutes a first cast-in heater, and including a second cast-in heater mounted in the second die.